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Remarks/Arguments:

Applicant wishes to thank the Examiner for his detailed comments. As Examiner has chosen to group his comments by section, Applicant shall address each of these sections and points in turn.

Claim Objections:

1. Examiner has stated:

"Claims 3 and 4 are objected to because of the following informalities: Claim 3 refers to itself and therefore Claim 4 refers to an improper dependent claim. Appropriate correction is required."

Claim 3, as presently amended, corrects this problem by correcting the dependency from "3" to "2".

Claim Rejections - 35 USC § 103:

2-3. Examiner has stated:

"Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Freitag et al. (USPub 2005,0122635) in view of Li et al. (USPN 6,909,583).

"Regarding claims 1, 10, and 19, Freitag et al. shows (Fig. 10), a disk drive comprising at least one hard disk, at least one magnetic head adapted to fly over the hard disk for writing data on the hard disk, and having an air bearing surface, the magnetic head including a read sensor including a free layer (202); a spacer layer (206); a plurality of self-pinned layers (220,222), but does not show interleaved layers of ferromagnetic metal and non-magnetic metal.

"Li et al shows interleaved layers (AP 1,15) of ferromagnetic metal and non-magnetic metal.

"It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the self-pinned layers of Freitag et al. with the interleaved layers as taught by Li et al. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to replace the self-pinned layers of Freitag et al with the interleaved layers as taught by Li et al to provide good pinning strength thus inhibiting amplitude flip."

The Claim 1 recites:

"a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal."

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The Li reference recites that it includes:

“A novel, specularly reflecting nano-oxide layer within its pinned layer”
(col. 3, lines 63-64).

Also, Li includes:

“An MnPt antiferromagnetic pinning layer (4)” (col. 4, lines 42-43),

and that

“The AP1 layer...comprising a layer of CoFe (17) ...a specularly reflecting FeTaO layer (19).. on which is formed a layer of CoFe (21)” (col. 4, lines 52-60).

Finally, Li recites:

“The present invention provides a method of improving the GMR ratio ...while **maintaining**” (emphasis added) “good pinning properties” (col. 3, lines 31-33).

The goal in Li is to increase the DR/R ratio, thus improving the sensitivity of the sensor, but is not concerned with producing self-pinned layers, as required by the elements of Claim 1 of the present invention. In Li, the specularly reflecting nano-oxide layer of FeTaO (19) is used to produce specular reflection of the electrons, which is related to the DR/R performance of the sensor, and has nothing to do with pinning the layer.

In fact, the layers of the AP1 structure (15) are not self-pinned at all, as evidenced by presence of the AFM layer (4). The present inventor informs me that FeTaO material is completely unsuitably for use in self-pinning structures, and on the contrary, the presence of FeTaO would be known by those skilled in the art to **degrade** pinning of the layers. Thus the emphasis by Li is on “maintaining good pinning properties”, meaning that Li has found a way to prevent the FeTaO material from impairing the pinning effect of the AFM layer on the pinned layer.

Thus, the FeTaO material does nothing to aid in self-pinning, and in fact, is known to have the opposite effect. Therefore, it would not have been obvious to one skilled in the art to replace the self-pinned layers of Freitag with the specularly reflecting nano-oxide layer of Li.

Since Li depends on an AFM layer to pin the pinned layer (despite the effect of the FeTaO), to replace the self-pinned layers of Freitag with the specularly reflecting nano-oxide layer of Li, would result in a structure with no pinning

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mechanism at all. There would be no motivation to combine these features because the device would then no longer function.

Thus it cannot be fairly said that the present invention is made obvious by the cited references, either alone or in combination.

Thus, applicant respectfully asserts that the present invention is not obvious in view of the cited references. Applicant respectfully requests that the rejection be withdrawn and Claim 1 be allowed.

4. Examiner has stated:

"Regarding Claims 2 and 11, Freitag et al shows (Fig. 10), the magnetic head, wherein the plurality of self-pinned layers includes AP1 (220) and AP2 (222), where AP1 (220) includes an odd number of layers of ferromagnetic material (CoPtCr)."

Claims 2 and 11 are dependent on Claims 1 and 10 respectively, and all include by their dependence the assertedly non-obvious feature of "a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal." of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 2 and 11 be allowed.

5. Examiner has stated:

"Regarding Claims 3, 12, and 20, Freitag et al shows (Fig. 10), the magnetic head, wherein the AP1 and the AP2 together have a net magnetic moment $dM=0$ (equal and opposite)."

Claims 3, 12, and 20 are dependent on Claims 1, 10 and 19 respectively and all include by their dependence the assertedly non-obvious feature of "a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal." of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 3, 12, and 20 be allowed.

In addition, Applicant can find no support for the statement that in Freitag "the AP1 and the AP2 together have a net magnetic moment $dM=0$ (equal and opposite)," but this point is unnecessary to argue here.

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6. Examiner has stated:

“Regarding Claims 4, 13, and 21, Freitag et al shows (Fig. 10), the magnetic head, wherein the $D_m=0$ corresponds to a dT less than 5×10^{-10} meters, wherein magnetic thickness $T=M \cdot t$, and M equals magnetization, t equals thickness of material, and dT is the differential in the layer thicknesses (inherent).”

Claims 4, 13, and 21 are dependent on Claims 1, 10 and 19 respectively and all include by their dependence the assertedly non-obvious feature of “a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal.” of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 4, 13, and 21 be allowed.

In addition, Applicant can find no support for the statement that Freitag shows “the magnetic head, wherein the $D_m=0$ corresponds to a dT less than 5×10^{-10} meters, wherein magnetic thickness $T=M \cdot t$, and M equals magnetization, t equals thickness of material, and dT is the differential in the layer thicknesses (inherent),” but this point is unnecessary to argue here.

7. Examiner has stated:

“Regarding Claims 5, 14, and 22, Freitag et al shows (Fig. 11), the magnetic head, wherein the plurality of self-pinned layers has $H_k > 200$ Oe.”

Claims 5, 14, and 22 are dependent on Claims 1, 10 and 19 respectively and all include by their dependence the assertedly non-obvious feature of “a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal.” of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 5, 14, and 22 be allowed.

In addition, Applicant can find no support for the statement that Freitag shows “the magnetic head, wherein the plurality of self-pinned layers has $H_k > 200$ Oe.” but this point is unnecessary to argue here.

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8. Examiner has stated:

“Regarding Claims 6, 15, and 23, Freitag et al shows (Fig. 10), the magnetic head, wherein the plurality of self-pinned layers is pinned by magnetostrictive anisotropy.”

Claims 6, 15, and 23 are dependent on Claims 1, 10 and 19 respectively and all include by their dependence the assertedly non-obvious feature of “a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal.” of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 6, 15, and 23 be allowed.

In addition, Applicant can find no support for the statement that Freitag shows “the magnetic head, wherein the plurality of self-pinned layers is pinned by magnetostrictive anisotropy”, but this point is unnecessary to argue here.

9. Examiner has stated:

“Regarding Claims 7 and 16, Freitag et al shows (Fig. 10), the magnetic head, wherein the ferromagnetic metal of the plurality of self-pinned layers is chosen from a group consisting of CoFe, CoFe/NiFe, and Fe.”

Claims 7 and 16 are dependent on Claims 1 and 10 respectively and all include by their dependence the assertedly non-obvious feature of “a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal.” of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 7 and 16 be allowed.

10. Examiner has stated:

“Regarding Claims 8 and 17, Freitag et al shows (Fig. 10), the magnetic head, wherein the non-magnetic metal of the plurality of self-pinned layers is chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re.”

Claims 8 and 17 are dependent on Claims 1 and 10 respectively and all include by their dependence the assertedly non-obvious feature of “a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal.” of the present invention.

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In addition, Applicant disagrees with the statement that Freitag shows “the magnetic head, wherein the non-magnetic metal of the plurality of self-pinned layers is chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re” because, as Examiner himself has stated above in section 3, Freitag “does not show interleaved layers of ferromagnetic and non-magnetic material” at all.

Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 8 and 17 be allowed.

11. Examiner has stated:

“Regarding Claims 9 and 18, Freitag et al shows [0042], the magnetic head, wherein the read sensor is of Current Perpendicular to the Plane (CPP) configuration.”

Claims 9 and 18 are dependent on Claims 1 and 10 respectively and all include by their dependence the assertedly non-obvious feature of “a plurality of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal.” of the present invention. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 9 and 18 be allowed.

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Conclusion:

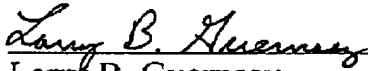
Applicant has endeavored to put this case into complete condition for allowance. It is thought that the current amendment has overcome the claim
5 objections, and that §103 rejections were unfounded on the references cited. Applicant therefore respectfully asks that the objection and rejections be withdrawn and that allowance of all claims presently in the case now be granted.

If the Examiner would like to discuss any of the points involved in the
10 Response, he is urged to contact Applicant's Attorney at the numbers included below.

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Respectfully Submitted,


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